

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. §371**

MERCK 2330

U.S. APPLICATION NO. (If known, see 37 CFR §1.5)

10/009487

INTERNATIONAL APPLICATION NO

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/EP00/05183

6 JUNE 2000

16 JUNE 1999

TITLE OF INVENTION

SPRAY-DRYING INSTALLATION AND A METHOD FOR USING THE SAME


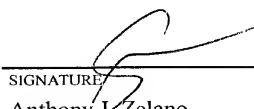
APPLICANT(S) FOR DO/EO/US

SCHWARZ, Eugen, et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. §371.
 2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. §371.
 3. ☐ This express request to begin national examination procedures (35 U.S.C. §371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. §371(b) and PCT Articles 22 and 39(1).
 4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
 5. ☒ A copy of the International Application as filed (35 U.S.C. §371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
 6. ☒ A translation of the International Application into English (35 U.S.C. §371(c)(2)).
 7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
 8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. §371(c)(3)).
 9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. §371(c)(4)).
 10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. §371(c)(5)).
- Items 11. to 16. below concern document(s) or information included:**
11. ☐ An Information Disclosure Statement under 37 C.F.R. §§1.97 and 1.98.
 12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. §§3.28 and 3.31 is included.
 13. ☒ A **FIRST** preliminary amendment.
 - ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
 14. ☐ A substitute specification.
 15. ☐ A change of power of attorney and/or address letter.
 16. ☐ Other items or information:

13 DEC 2001

U.S. APPLICATION NO. (if known, see 37 CFR §1.5) 10/009487		INTERNATIONAL APPLICATION NO. PCT/EP00/05183		ATTORNEY'S DOCKET NUMBER MERCK 2330	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR §1.492 (a) (1) - (5)): Search Report has been prepared by the EPO or JPO..... \$890.00 International preliminary examination fee paid to USPTO (37 CFR §1.482)..... \$710 00 No international preliminary examination fee paid to USPTO (37 CFR §1.482) but international search fee paid to USPTO (37 CFR §1.445(a)(2))..... \$740.00 Neither international preliminary examination fee (37 CFR §1.482) nor international search fee (37 CFR §1.445(a)(2)) paid to USPTO..... \$1040.00 International preliminary examination fee paid to USPTO (37 CFR §1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)..... \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT = \$890.00				CALCULATIONS PTO USE ONLY	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. §1.492(c)).					
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	18 - 20 =	0	x \$ 18.00	\$0.00	
Independent claims	3 - 3 =	0	x \$ 84.00	\$0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$ 280.00		
TOTAL OF ABOVE CALCULATIONS =				\$890.00	
Reduction of 1/2 for filing by small entity, if applicable. A Verified Small Entity Statement must also be					
SUBTOTAL =				\$890.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. §1.492(f)).					
TOTAL NATIONAL FEE =				\$890.00	
Fee for recording the enclosed assignment (37 C.F.R. §1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. §§3.28, 3.31). \$40.00 per property.					
TOTAL FEES ENCLOSED =				\$890.00	
				Amount to be refunded:	
				charged:	
a. <input checked="" type="checkbox"/> A check in the amount of \$890.00 to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. 13-3402 in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-3402. A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 C.F.R. §§1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. §1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO Customer Number 23,599					
 23599 PATENT TRADEMARK OFFICE					
Filed: 13 DECEMBER 2001 AJZ:kmo					
SIGNATURE  Anthony J. Zelano NAME 27,969 REGISTRATION NUMBER					

IN THE UNITED STATES DESIGNATED/ELECTED OFFICE

International Application No. : PCT/EP00/05183
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Priority Date(s) Claimed : 16 JUNE 1999
Applicant(s) (DO/EO/US) : SCHWARZ, Eugen, et al.

Title: SPRAY-DRYING INSTALLATION AND A METHOD FOR USING THE SAME

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

SIR:

Prior to calculating the national fee, and prior to examination in the National Phase of the above-identified International application, please amend as follows:

IN THE CLAIMS:

5. (Amended) The process as claimed in claim 1, characterized in that the gas is circulated.
6. (Amended) The process as claimed in claim 1, characterized in that the circulated gas is freed from particles by filters and re-fed to the spray nozzles or heated and introduced into the fluidized bed.
7. (Amended) The process as claimed in claim 1, characterized in that the gas is freed from particles with the aid of dynamic filters.
8. (Amended) The process as claimed in claim 1, characterized in that the liquid media used have different compositions at different points of the plant.

9. (Amended) The process as claimed in claim 1, characterized in that that particle sizes of from 50 to 1000 μm can be established specifically by varying the parameters spray pressure, amount of liquid, amount of powder returned, hot-air stream and temperature of the hot air.

REMARKS

The purpose of this Preliminary Amendment is to eliminate multiple dependent claims in order to avoid the additional fee. Applicants reserve the right to reintroduce claims to canceled combined subject matter.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned **“Version With Markings to Show Changes Made”**.

Respectfully submitted,



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AJZ:kmo

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$$\begin{aligned} & \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) u = 0, \quad u|_{x=0} = u|_{y=0} = u|_{x=a} = u|_{y=b} = 0, \\ & u(x,y,z) = \sum_{n,m} A_{nm} \sin \frac{n\pi x}{a} \sin \frac{m\pi y}{b} e^{-\sqrt{\frac{n^2}{a^2} + \frac{m^2}{b^2}} z}, \end{aligned}$$

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Spray-drying plant, and process for the use thereof

The invention relates to a fluidized-bed apparatus with integrated spray drying and to a process for the use thereof. The invention also relates to a process for the production of spray-dried powder material whose product properties can be varied in a targeted manner depending on the further use.

Commercially available granular materials are usually produced by spraying a solution or suspension of one or more components into a spray tower charged with hot gas. In the stream of hot gas, the liquid components evaporate, and solid particles which have a more or less random shape form.

Also known is granulation in a fluidized bed, in which the stream of process air flows through a specially shaped feed base, generating a fluidized bed of solid starting material. The spray liquid enters the fluidizing space in finely divided form through a nozzle system. The fluidizing particles are wetted, the surface is partially dissolved, and the particles adhere together. At the end of the fluidized bed, solid is removed continuously. At the same time, a smaller amount of solid finely divided in the spray liquid is fed in at the inlet. A filter system prevents dust leaving the fluidized bed and ensures that only granular material particles having a minimum size are removed at the outlet. Solid particles with a more less random shape likewise form in a fluidized bed of this type.

It is therefore an object of the invention to provide a suitable plant and a process for operating the plant with the aid of which properties of spray-dried or granulated, pulverulent products can be varied as

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5 desired with respect to particle size, particle size distribution, moisture content and tableting ability.

The object is achieved by a spray-drying plant which has

- 10 a) a spray-drying unit (B)
- b) a fluidized bed (A)
- c) one or more additional spray or atomization nozzles for liquid media (C)
- e) a powder metering device (D)
- 15 f) a powder return (9) with fan (E).

In the spray-drying unit of the spray-drying plant according to the invention, (B) liquid medium (5), spray air (6), pulverulent material (9) and hot air (4)

20 are combined.

A particular embodiment consists in that a spray-drying unit (B) is located vertically above a downstream fluidized bed in a spray tower.

25 In a specific embodiment, the spray-drying unit (B) of the plant can comprise a spray system which consists of a two-component spray nozzle heated by hot water with coaxially arranged powder return and hot-gas

30 surrounding flow.

The object is achieved, in particular, by a plant in which one or more additional spray or atomization nozzles for liquid media (C) can be installed in the

35 fluidized bed at variable locations. In accordance with the present invention, the fluidized bed is followed by a powder metering device (D), which is separated off by a paddle valve (F) and is fed by an overflow (8).

40 Some of the product formed can, in accordance with the invention, be returned, if desired after comminution, into the spray-drying unit (B) via a fly conveyor, in which a fan (E) serves as conveying element. The fan

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- 5 (E) acting as conveying element can simultaneously serve as comminution unit for the returned powder.

The object is also achieved by a process for the production of spray-dried powder material in which

- 10 a) in a first step, a liquid medium, spray gas, pulverulent material and hot air are combined,
 b) the pulverulent product formed falls into a fluidized bed, is taken up, fluidized and transported further,
 15 c) in one or more granulation step(s), is sprayed with further liquid medium, dried and conveyed in the fluidized bed toward the powder metering device, from which
 d) some of the pulverulent material is returned into
 20 the process.

The liquid medium is a solution, a dispersion or a suspension.

- 25 A particular variant of the process consists in that the returned pulverulent material is comminuted before return.

- The spray gas, carrier gas and heating gas used can be
 30 air or an inert gas selected from the group consisting of N_2 and CO_2 . The gas can, in accordance with the invention, be circulated, in which case it is freed from particles by means of filters or with the aid of dynamic filters and fed back to the spray nozzles or
 35 heated and introduced into the fluidized bed.

In accordance with the invention, liquid media used at various points of the plant can have different compositions.

40

The present object is also achieved, in particular, by allowing particle sizes of from 50 to 1000 μm to become established specifically by varying the parameters

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5 spray pressure, amount of liquid, amount of powder returned, hot-air stream and temperature of the hot air.

10 In order to carry out the process, the plant is charged at the beginning with pulverulent starting material via the fill port (3). A stream of air is generated in the spray-drying space via the chambers (1). The starting material introduced is fluidized by this stream of air and moves toward the discharge flap (F). The stream of
15 powder is given this movement direction on generation of the stream of air by an appropriate perforation of the Conidur base. The fluidized product can be discharged by simply opening the paddle valve (F). At this point of the plant, devices are provided which
20 enable the product to be fed either into a powder metering device or via a fly conveyor to the spray-drying unit. An overflow (8) for the finished product is located at the outlet above the powder metering device. The fan (E) of the spray-drying unit serves
25 both as conveying means for the product and as comminution unit for powder material to be returned. Through a particular design of the spray-drying nozzle, returned powder material from the return line (9) is combined with the corresponding media liquid (5), spray
30 air (6) and hot air (4). The powder or granular material formed is taken up by the fluidized bed and transported further as already described above. On passing through the granulation nozzles (C), further medium, which may have a different composition to the
35 medium introduced into the spray nozzle with powder return, is sprayed onto the particles formed. Further granulation and re-setting of the particle size distribution take place. Air introduced from the chambers (1) via the Conidur bases will dry the product
40 to the desired final moisture content. A dynamic filter (G) integrated into the plant will prevent discharge of powder particles into the environment.

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5 Instead of the three granulation nozzles (C), as shown
in figure 1, one or more spray nozzles or spray-drying
nozzles or alternatively only one, two or more than
three granulation nozzles may be installed at the
corresponding point of the plant. These additional
10 nozzles can be located directly at the beginning of the
fluidized bed or moved further to the back. The choice
of the location at which the powder material originally
formed is re-sprayed once or more than once is also
dependent, inter alia, on the residual moisture content
15 that the desired product is intended to have. It goes
without saying that a product having a particularly low
residual moisture content requires a longer residence
time in the fluidized bed after the final spraying than
one with a relatively high residual moisture content.

20

If desired, different compositions can be applied
through the various nozzles to the particle surfaces
already formed, enabling particles having a layered
structure to be obtained. However, it can also serve to
25 achieve a more uniform particle size distribution.

Furthermore, the plant according to the invention can
be operated not only with air as carrier medium, but it
is also possible to operate the entire plant in
30 circulation with an inert gas, such as, for example,
nitrogen, or with carbon dioxide gas.

The plant is designed in such a way that the parameters
amount of liquid, spray pressure, amount of powder
35 returned, amount of hot gas, hot-gas temperature,
amount of warm air and warm-air temperature can be
regulated individually. The properties of the end
product can be adjusted as desired with respect to the
moisture content, the particle size and the particle
40 size distribution through the amount of powder
returned, the amount of liquid fed in and the spray
pressure. Pulverulent products having particle sizes of
from 50 to 1000 μm can be produced as desired in the

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5 plant described. Depending on the mode of operation,
the particles can consist of a single chemical
substance or exhibit a layered structure of different
substances or, depending on the process parameters
selected, have a more or less crystalline or
10 predominantly amorphous structure, where, in the latter
case, the particles can consist either of one component
or a mixture of different components.

The formation of the particles is controlled, in
15 particular, by a spray nozzle suitable for the
production of spray-dried granular materials which is
integrated into the plant. A corresponding embodiment
of a spray nozzle of this type is shown in fig. 2.

20 This spray nozzle is a spray system which consists of a
two-component spray nozzle [(1), (2), (3)] which can be
heated with hot water and is in turn fitted with a
coaxially arranged powder return (4) and a hot-gas
surrounding flow (5).

25 The advantage of this spray system is that the powder
comes into contact directly at the outlet with the
liquid droplets produced via the atomization air and is
granulated or agglomerated. In order that the granules
30 do not stick together and the surface moisture can be
removed, the spray and powder parts are enclosed in a
stream of hot gas, where the requisite energy for
evaporating the liquid is converted directly.
Subsequent drying takes place in the fluidized bed.

35 In particular also through incorporation of this spray-
drying system, it is possible to achieve specific
particle sizes.

40 A particular advantage of this spray-drying plant
therefore consists in that very different products can
be produced in a single plant depending on the process
parameters set and on the liquid media to be sprayed.

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5 For better understanding and for illustration, a
 general flow chart (fig. 1) of the spray-drying plant
 described and examples which come within the scope of
 protection of the present invention, but are not
 10 suitable for restricting the invention to these
 examples, are given below.

Fig. 1 shows a generalized flow chart of a possible
 embodiment of a spray-drying plant of this type, in
 15 which the numerals and/or letters given have the
 following meanings:

- 1 Air introduction chambers
- 2 Air outlet chambers
- 20 3 Fill port
- 4 Hot-air feed
- 5 Liquid feed
- 6 Spray air
- 7 Heating medium
- 25 8 Product
- 9 Powder
- A Fluidized-bed apparatus
- B Spray-drying unit
- C Granulation nozzles
- 30 D Powder metering device
- E Fan for powder return
- F Paddle valve
- G Dynamic filter

35 With reference to the components mentioned in the
 description and given in the flow chart, it is readily
 possible for the person skilled in the art to construct
 a corresponding plant by selecting commercially
 available individual components. It goes without saying
 40 to the person skilled in the art working in the
 specialist area that both additional electrical and
 mechanical control units must be incorporated for

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PATENT CLAIMS

1. A process for the production of spray-dried powder material, characterized in that
 - a) in a first step, a liquid medium, spray gas, pulverulent material and hot air are combined,
 - b) the pulverulent product formed falls into a fluidized bed, is taken up, fluidized and transported further,
 - c) in one or more granulation step(s) is sprayed with further liquid medium, dried and conveyed in the fluidized bed toward the powder metering device, from which
 - d) some of the pulverulent material is returned into the process.
2. The process as claimed in claim 1, characterized in that the liquid medium is a solution, a dispersion or a suspension.
3. The process as claimed in claim 1, characterized in that the returned pulverulent material is comminuted before return.
4. Process as claimed in claim 1, characterized in that air or an inert gas selected from the group consisting of N₂, CO₂ or is used both as spray gas and as carrier gas and heating gas.
5. The process as claimed in claims 1 and 4, characterized in that the gas is circulated.
6. The process as claimed in claims 1, 4 and 5, characterized in that the circulated gas is freed from particles by filters and re-fed to the spray nozzles or heated and introduced into the fluidized bed.

- 5 7. The process as claimed in claims 1 and 4 to 6, characterized in that the gas is freed from particles with the aid of dynamic filters.
- 10 8. The process as claimed in claims 1 and 2, characterized in that the liquid media used have different compositions at different points of the plant.
- 15 9. The process as claimed in claims 1 to 8, characterized in that that particle sizes of from 50 to 1000 μm can be established specifically by varying the parameters spray pressure, amount of liquid, amount of powder returned, hot-air stream and temperature of the hot air.
- 20 10. A spray-drying plant, characterized by
 - a) a spray-drying unit (B)
 - b) a fluidized bed (A)
 - 25 c) one or more additional spray or atomization nozzles for liquid media (C)
 - e) a powder metering device (D) and
 - f) a powder return (9) with fan (E).
- 30 11. The spray-drying plant as claimed in claim 10, characterized in that liquid medium (5), spray air (6), pulverulent material (9) and hot air (4) are combined in the spray-drying unit (B).
- 35 12. The spray-drying plant as claimed in claim 10, characterized in that a spray-drying unit (B) is located vertically above a downstream fluidized bed in a spray tower.
- 40 13. The spray-drying plant as claimed in claim 10, characterized in that the spray-drying unit (B) comprises a spray system which consists of a two-component spray nozzle heated by hot water with

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- 5 coaxially arranged powder return and hot-gas
surrounding flow.
14. The spray-drying plant as claimed in claim 10,
characterized in that one or more additional spray
10 or atomization nozzles for liquid media (C) can be
installed in the fluidized bed at variable
locations.
15. The spray-drying plant as claimed in claim 10,
15 characterized in that the fluidized bed is
followed by a powder metering device (D), which is
separated off by a paddle valve (F) and is fed by
an overflow (8).
- 20 16. The spray-drying plant as claimed in claim 10,
characterized in that some of the product formed
is returned, if desired after comminution, into
the spray-drying unit (B) via a fly conveyor, in
which a fan (E) serves as conveying element.
- 25 17. The spray-drying plant as claimed in claim 16,
characterized in that the fan (E) simultaneously
serves as comminution unit for the returned
powder.
- 30 18. A spray system consisting of a two-component spray
nozzle heated by hot water with coaxially arranged
powder return and hot-gas surrounding flow.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
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Veröffentlicht:

— Mit internationalem Recherchenbericht.

Zur Erklärung der Zweibuchstaben-Codes, und der anderen
Abkürzungen wird auf die Erklärungen ("Guidance Notes on
Codes and Abbreviations") am Anfang jeder regulären Ausgabe
der PCT-Gazette verwiesen.

(54) Title: SPRAY-DRYING INSTALLATION AND A METHOD FOR USING THE SAME

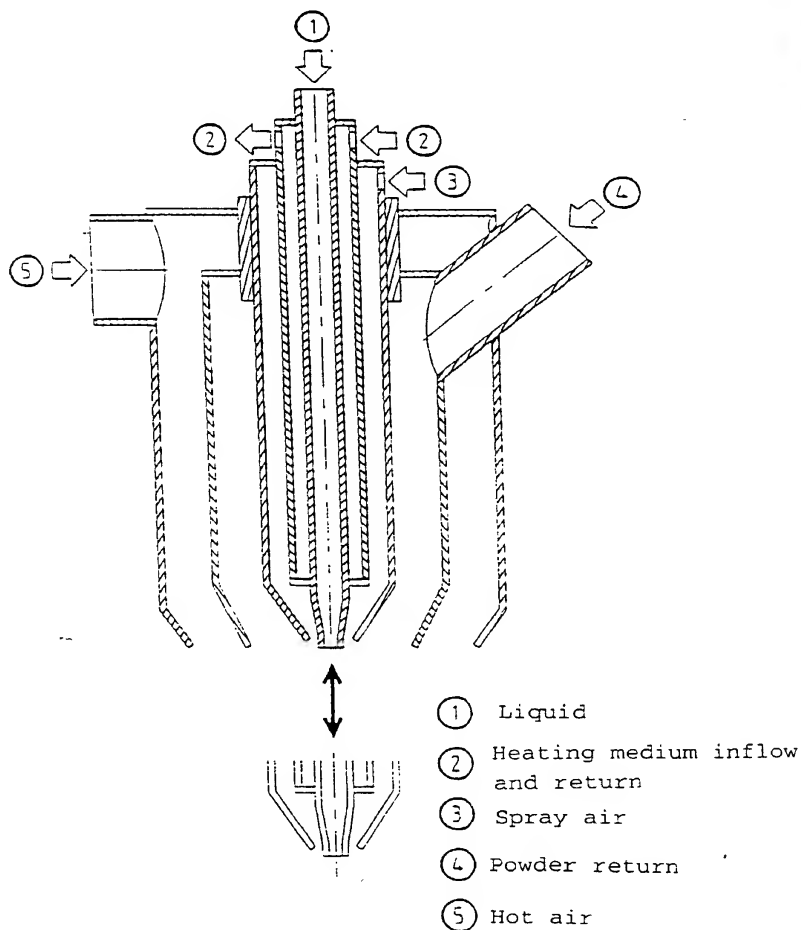
(54) Bezeichnung: SPRÜHTROCKNUNGSANLAGE UND VERFAHREN ZU IHRER VERWENDUNG

(57) Abstract: The invention relates to fluidised bed apparatus with an integrated spray-drying device and to a method for using the same. The invention also relates to a method for producing spray-dried powder material, whose product characteristics can be specifically adapted according to the ulterior use of said material.

(57) Zusammenfassung: Die Erfindung betrifft einen Fließbettapparat mit integrierter Sprühtrocknung sowie ein Verfahren zu dessen Verwendung. Gegenstand der Erfindung ist auch ein Verfahren zur Herstellung von sprühgetrocknetem Pulvermaterial, dessen Produkteigenschaften je nach weiterer Verwendung gezielt variiert werden können.

WO 00/76650 A1

Fig. 2



Docket No.
Merck

Declaration and Power of Attorney For Patent Application English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Spray-drying installation and a method for using the same

the specification of which

(check one)



is attached hereto.



was filed on 06.06.2000 as United States Application No. or PCT International
Application Number PCT/EP00/05183
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

199 27 537.8
(Number)

Germany
(Country)

16.06.1999
(Day/Month/Year Filed)



(Number)

(Country)

(Day/Month/Year Filed)



(Number)

(Country)

(Day/Month/Year Filed)



I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U.S.C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States of PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112. I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C.F.R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

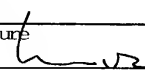
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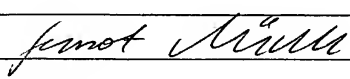
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